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Heterogeneity in European Research Integrity Guidance: Relying on Values or Norms?

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Abstract

Similar forms of misconduct are perceived differently throughout Europe. There are no extensive surveys on the guidance on research integrity in the different countries of Europe. Therefore, we performed a systematic content analysis of (biomedical) research integrity guidance documents from all the countries of the European Economic Area. We show that there is strong heterogeneity concerning research integrity guidance on crucial aspects, for example, the defining of research misconduct, at both an international and a national level. We also sought to explain why the guidance documents differ by distinguishing the approaches that underlie them. We distinguished a value-based and a norm-based approach, as well as different perspectives on trust. The current confusing situation concerning research integrity guidance hampers international research and possibly wastes research funds. We risk talking past each other, if we do not take the distinction between these underlying approaches into account.

Keywords

authorship, peer review, publication ethics, questionable research, conflicts of interest, research integrity, research misconduct, prevention, science policy, guidance

Research misconduct makes the headlines of academic journals (Cyranoski, 2014; Kennedy, 2002). Research integrity and misconduct are important to all stakeholders within and outside science. These issues have been the subject of some recent research (Anderson et al., 2007; Bosch, Hernández, Pericas, Doti, & Marušić, 2012; De Vries, Anderson, & Martinson, 2006; Fanelli, 2009, 2010; Fang, Steen, & Casadevall, 2012; Martinson, Anderson, Crain, & De Vries, 2006; Martinson, Anderson, & De Vries, 2005; Steen, 2011; Titus, James, & Rhoades, 2008). However, although almost a quarter of global research and development takes place in the EU (National Science Board, 2012), and although European countries have not been spared from research misconduct scandals (Callaway, 2011), few studies have been published on research integrity in Europe (Bosch, 2011; European Science Foundation, 2010). Research integrity is also an issue beyond the scientific community, as evidenced by the research misconduct accusations aimed at prominent European politicians. Some of them have had to quit their office (Kupferschmidt & Vogel, 2013; Schiermeier, 2012).

Misconduct shakes science to its very foundation: It erodes the trust. Scientists need to trust each other for research to advance, and society needs to trust science to fund it (Shamoo & Resnik, 2009). However, research misconduct is defined heterogeneously throughout Europe. Most definitions include the concepts of fabrication (inventing data or cases), falsification (intentionally misrepresenting data or results), and plagiarism (copying texts, data, or ideas without referring to the original source; Godecharle, Nemery, & Dierickx, 2013a). In addition, guidance documents include many principles that are considered to constitute research integrity, with honesty and reliability featuring most frequently, but the list of principles is long and diverse (Godecharle et al., 2013a).

Similar actions of research misconduct are approached differently. In the United States and the United Kingdom, researchers who falsified and fabricated data have been imprisoned (Torres, 2010). However, the Dutch researcher Stapel, who's fraud became notorious, has only been sentenced to 120 hr of community service (Van Noorden, 2013). In Italy, there is currently a police investigation concerning a research fraud allegation, and it is advocated that researchers could at least learn from police methods for

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dealing with serious research misconduct allegations ("Call the Cops," 2013). In other countries, the self-regulation of science is emphasized and research fraud is not considered to be a matter for the legal courts.

We conducted a comparative analysis of the guidance documents in the European economic area. We refer to these documents, which include laws and guidelines, as "guidelines." Previously, we distinguished two main approaches: guidelines utilizing a positive approach, emphasizing the principles of research integrity, and those using a negative approach, giving a definition of misconduct (Godecharle et al., 2013a). In the present article, we performed a systematic content analysis, and extracted and analyzed the data on all the aspects of research integrity and misconduct that were mentioned and discussed most frequently in the guidelines. We also sought to understand why the guidelines differ.

Method

We performed a comprehensive search for guidance documents concerning research integrity or misconduct, aimed at biomedical research or research in general, from all the countries belonging to the EU or the European Free Trade Association. The methods used for this search and an overview of these documents can be found in our previous publication (Godecharle et al., 2013a). Throughout this article, we use the word misconduct to identify infringements on scientific integrity.

We conducted a systematic content analysis of the received guidelines, for which we used a structured data-abstraction instrument (Elo & Kyngäs, 2008). First, we familiarized ourselves with the data by reading all received guidelines at least twice. Second, different (sub-)categories, representing the various elements present in the guidelines, were derived inductively by reading through all guidelines several times. We frequently discussed the content and representation of these classification categories. The different sub-categories are organized within two categories, representing the major approaches: research integrity and research misconduct. The topics covered by the sub-categories are the themes that were emphasized most frequently by the guidelines and are subject of heterogeneity. Table 1 gives an overview of all (sub-)categories used in the data-abstraction instrument. Table 2 gives an overview of the content and frequency of the themes discussed within these (sub-)categories in the guidelines. We included the themes that featured at least in two different guidelines. The guidelines were analyzed, provided they were available in English, French, German, Dutch, or Italian. No statistical analyses were needed for this descriptive study.

Results

Retrieved Guidelines

We sent more than 340 emails, and received replies from 30 out of the 31 target countries. Forty-nine guidelines, generated by 19 countries, were included for analysis. These 19 countries are responsible for 87% of all published scientific citable documents of the target population (SCImago Lab, 2012). The 49 documents differed markedly not only in content but also in length: They ranged from 1 page to 129 pages.

Research Integrity

Importance of research integrity. Almost 15% of the guidelines directly links research integrity to research quality (see Table 2: 1.1). An intrinsic part of research is publishing (Health Research Board, 2010; Swedish Research Council, 2011). It is emphasized that authors should be responsible, but no agreement exists on what the authors are responsible for (see Table 2: 1.1). Originality and quality are considered more important than producing results quickly or publishing as much as possible (Hungarian Academy of Sciences, 2010; Swiss Academies of Arts and Sciences, 2008), especially as a criterion for academic career advancement, the allocation of resources, and the assessment of research performance (Austrian Agency for Research Integrity, 2010; German Research Foundation, 1998). Scientists should also inform the general public (see Table 2: 1.1), because public trust is crucial to all public funding of science (Swedish Research Council, 2011; Swiss Academies of Arts and Sciences, 2008).

Threats toward research integrity. In the guidelines, two main threats to research integrity can be distinguished: the inaccurate preservation of data and conflicts of interest.

Different perspectives emerge concerning the possible causes and the kinds of conflicts (see Table 2: 1.2). Conflicts of commitment are explicitly mentioned, caused by competing demands, such as teaching commitments, which can result in the neglect of research (Irish Council of Bioethics, 2010; Ministry of Science and Information Technology, 2004; Polish Academy of Sciences, 2001). Several guidelines emphasize the management of conflicts of interest rather than their possible prevention (see Table 2: 1.2). An Irish guideline even states that conflicts of interest are unavoidable and not necessarily harmful (Irish Council of Bioethics, 2010). Nevertheless, no agreement exists about when a researcher should withdraw from a research project. Some guidelines emphasize that reasonable doubt for a conflict of interest is a sufficient reason to withdraw (Association of Universities in the Netherlands, 2012; Latvian Academy

Table 1. (Sub-)Categories of Data-Abstraction Instrument.

Category	Sub-category
Research integrity	Importance of research integrity
	Threats toward research integrity
Research misconduct	Defining research misconduct
	Factors contributing to misconduct
	Impact of misconduct
	Detecting research misconduct
	Dealing with allegations of misconduct
	Preventing misconduct

of Sciences, 1997). However, one of the U.K. guidelines distinguishes less serious conflicts of interest from severe conflicts of interest. Only in the latter situation, researchers should withdraw from the project:

> When addressing a conflict of interest, it must be decided whether it is of a type and severity that poses a risk of fatally compromising the validity or integrity of the research, in which case researchers and organizations should not proceed with the research, or whether it can be adequately addressed through declarations and/or special safeguards relating to the conduct and reporting of the research. (U.K. Research Integrity Office, 2009)

Adequate preservation of primary data is essential for verifying the findings. Therefore, the inadequate preservation of primary data threatens research integrity. Several guidelines address the issue of the preservation of primary data, but a substantial variety exists concerning how long these data should be stored: ranging from no clear time indication, up to 10 years (see Table 2: 1.2). The loss of primary data could be a sign of research misconduct or gross negligence (German Research Foundation, 1998).

Research Misconduct

What constitutes research misconduct? More than 60% of the guidelines give a clear definition of misconduct (see Table 2: 2.1). A relatively short definition of research misconduct is given by two of the Danish guidelines:

> Scientific dishonesty shall mean: Falsification, fabrication, plagiarism and other serious violation of good scientific practice committed willfully or grossly negligent on planning, performance or reporting of research results. (Danish Law, 2009; Danish 787 Law, 2010)

Table 2. Overview of the Themes Discussed, Within the Distinguished (Sub-)Categories, by at Least Two Guidelines.

Themes discussed within the (sub-)categories of the guidelines			Guidelines (n = 49)
1. Research integrity	1.1	Importance of research integrity	
		Stress the link between research integrity and research quality	7
		Responsibility of authors	
		Authors are responsible for the published content	12
		Authors are responsible for the integrity of the entire project	2
		Scientists must inform the general public	5
	1.2	Threats toward research integrity	
		Conflicts of interest	19
		Causes of conflicts of interest	
		Financial interests	6
		External pressure	5
		Interest of third parties or personal relationships	4
		Personal conflicts of interest	2
		Various kinds of conflicts	
		Distinguish potential and apparent conflicts	10
		Distinguish personal and institutional conflicts	3
		Conflicts of commitments	3
		Emphasizing the management of conflicts of interest by focusing on transparency	11
		Preservation of data	12
		Varying requirements of scientific disciplines	3
		Data preservation for at least 3 years	2
		Data preservation for at least 5 years	3
		Data preservation for at least 10 years	2
2. Research misconduct	2.1	Misconduct	
		Give clear definition of misconduct	31
		Inclusion of possible intention, negligence, or deceit in definition of misconduct	16
		Malpractices concerning publication and authorship	
		Honorary or gift authorship	16
		Selective publication of desirable results	15
		Ghost authorship	3
	2.2	Factors contributing to misconduct	
		Competition	10
		For ever more publications and applicable results	9
		For research funds and financial contracts	7
		For academic careers and scientific evaluation	4
		Personal motivations (desire to be successful or to be recognized)	2
	2.3	Impact of misconduct	
		Trust is foundational to science	15
		Misconduct damages trust	11
		Damage to the mutual trust between scientists	8
		Damage to the trust between society and science	7
		Damage to the trust of funding providers	2
		Damage to reputation	10
		Damage to the reputation of the individual researcher	6
		Damage to the reputation of research in general	5
		Damage to the reputation of research institutions	4
		Damage to the reputation of research projects	2
	2.4	Detecting research misconduct	
		Possible detection of misconduct through peer review	4
	2.5	Dealing with allegations of misconduct	
		Institutions should have adequate procedures	11
		Employer/institution has first responsibility for handling allegations	8

(continued)

Table 2. (continued)

Themes discussed within the (sub-)categories of the guidelines		Guidelines (n = 49)
	Procedure should be rapid and confidential	8
	Reputation of both the whistle-blower and the person accused must be protected	4
	Whistle-blowers can also be motivated by dishonest intentions	4
	No punishment should be made until the misconduct is proven	4
	All parties should be heard during the handling of research misconduct allegations	3
2.6	Preventing misconduct	
	Emphasizing research integrity training	22
	Emphasizing research environment and daily practice	5

Various elements are included in the definitions of research misconduct of the other guidelines, such as the inadequate management of raw data or materials (Austrian Agency for Research Integrity, 2010; Hungarian Academy of Sciences, 2010; Irish Council of Bioethics, 2010; Royal Irish Academy, 2010; Swiss Academies of Arts and Sciences, 2008; Wellcome Trust, 2005), the violation of intellectual property of other scientists (All European Academies, Royal Netherlands Academy of Arts and Sciences, Netherlands Organisation for Scientific Research, & Association of Universities in the Netherlands, 2003; Austrian Agency for Research Integrity, 2010; Royal Netherlands Academy of Arts and Sciences, 2001; Swiss Academies of Arts and Sciences, 2008), a breach of confidence as a reviewer or supervisor (Estonian Academy of Sciences, 2002; German Research Foundation, 1998), and bringing personal influence to bear in decisions or evaluations (Hungarian Academy of Sciences, 2010). Every definition of misconduct in the guidelines includes different elements, apart from the guidelines of Denmark and Norway. Although heterogeneity exists concerning these definitions, the concepts of fabrication, falsification, and plagiarism feature most prominently (Godecharle et al., 2013a). A Polish guideline, however, considers plagiarism to be less serious than fabrication and falsification: ". . . cases of misconduct related to falsification of research results are much more dangerous to science and its structures than plagiarism, which is easier to detect" (Ministry of Science and Information Technology, 2004).

Several guidelines consider the intention to deceive to be crucial in determining whether an action qualifies as misconduct (see Table 2: 2.1). However, one Swedish guideline underlines that the definition of research misconduct should encompass both intentional and unintentional actions (Swedish Research Council, 2011). It states that falsification covers all sorts of manipulations, which can be unintentional, whereas fabrication is intentional by definition. However, both falsification and fabrication are considered to be misconduct:

> Manipulation of research—as opposed to cases of fabrication—can be the unintentional result of carelessness or ignorance, and it can be difficult to determine whether intentional misconduct has occurred. (Swedish Research Council, 2011)

The guidelines explicitly condemn several malpractices concerning publication (see Table 2: 2.1). There is a general consensus that a creative contribution is required to be qualified as an author.[1]

Factors contributing to misconduct. The guidelines address several factors that contribute to misconduct. On one hand, there are personal motivations, such as the desire to be recognized (Belgian National Academy of Science, 2009) and a desire to be successful (Ministry of Science and Information Technology, 2004). On the other hand, the concept of competition is emphasized, which is approached from different angles (see Table 2: 2.2). There is the competition for ever more publications and the pressure to deliver results that can be applied as quickly as possible (Belgian National Academy of Science, 2009; German Research Foundation, 1998; Hellenic National Bioethics Commission, 2008; Hungarian Academy of Sciences, 2010; Irish Council of Bioethics, 2010; Ministry of Science and Information Technology, 2004; National Institute for Health and Medical Research, 2000; Royal Irish Academy, 2010; Swedish Research Council, 2011), the competition for research funds and financial contracts (Danish Committees on Scientific Dishonesty, 2009; Hellenic National Bioethics Commission, 2008; Hungarian Academy of Sciences, 2010; Irish Council of Bioethics, 2010; Ministry of Science and Information Technology, 2004; Royal Irish Academy, 2010; Swedish Research Council, 2011), and the competition concerning academic careers and the evaluation of scientific work (German Research Foundation, 1998; Hungarian Academy of Sciences, 2010; Irish Council of Bioethics, 2010; Royal Irish Academy, 2010). However, competition is also considered to be important and even fruitful (All European Academies et al., 2003; Irish Council of Bioethics, 2010; Royal Netherlands Academy of Arts and Sciences, 2001).

Impact of misconduct. The direct impact of biomedical research on society is emphasized (Hellenic National Bioethics Commission, 2008, 2011). Misconduct in biomedical

research can lead to bad medication (Hungarian Academy of Sciences, 2010) and poorer treatment (Swedish Research Council, 2011). Most guidelines condemn misconduct because it damages trust and reputation. However, these concepts are approached from different perspectives (see Table 2: 2.3). The kind of trust that is endangered by research misconduct ranges from the trust between society and the scientific community (Belgian National Academy of Science, 2009; Estonian Academy of Sciences, 2002; Irish Council of Bioethics, 2010; Ministry of Science and Information Technology, 2004; Polish Academy of Sciences, 2001; Royal Irish Academy, 2010; Swedish Research Council, 2011), the mutual trust between scientists (All European Academies et al., 2003; Belgian National Academy of Science, 2009; Estonian Academy of Sciences, 2002; German Research Foundation, 1998; Ministry of Science and Information Technology, 2004; Polish Academy of Sciences, 2001; Royal Netherlands Academy of Arts and Sciences, 2001; Swedish Research Council, 2011;), to the trust of funding providers (German Research Foundation, 1998; Swedish Research Council, 2011). Damage toward reputation is also addressed from various perspectives: the reputation of the individual researcher (Austrian Agency for Research Integrity, 2011; Irish Council of Bioethics, 2010; Latvian Academy of Sciences, 1997; Polish Academy of Sciences, 2001; U.K. Research Integrity Office, 2008, 2009), the institutions (Austrian Agency for Research Integrity, 2011; German Research Foundation, 1998; Irish Council of Bioethics, 2010; Royal Irish Academy, 2010), research projects (U.K. Research Integrity Office, 2008, 2009), and also the reputation of research in general (Austrian Agency for Research Integrity, 2011; Irish Council of Bioethics, 2010; Ministry of Science and Information Technology, 2004; Royal Irish Academy, 2010; Swiss Academies of Arts and Sciences, 2008).

Detecting research misconduct. Various guidelines underline the possible identification of research misconduct through the peer-review process (see Table 2: 2.4). However, reservations are also voiced regarding its effectiveness: Peer review cannot detect every kind of research misconduct, because reviewers do not have the original data or the time to replicate the research (German Research Foundation, 1998; Irish Council of Bioethics, 2010), and the review process, like the whole of science, depends on trust.

> One reason the system has been challenged is a number of flagrant cases of peer reviewers abusing the trust which being given access to a colleague's work to assess it entails. Such abuses have included reviewers stealing ideas from submitted manuscripts, "sitting on" manuscripts for a long time to enable researchers in their own groups to publish their results first, or trying without just cause to prevent the publication of colleagues' work. (Swedish Research Council, 2011)

Authors depend on confidentiality from the side of the reviewers and their goodwill in not plagiarizing their ideas, research results, or texts (German Research Foundation, 1998). Because more and more manuscripts are submitted, it can also be difficult for journals to find willing and competent reviewers (Swedish Research Council, 2011). In addition, the reviewers are often competitors of the authors (German Research Foundation, 1998).

There is unanimity that reviewers should act with the greatest integrity, objectivity, and thoroughness. However, various views are apparent about what part of the research should be submitted for peer review. Some limit peer review to the publication process (German Research Foundation, 1998), while others extend it to the entire scientific process, including the evaluation of grant applications and during the ethics review of research projects (U.K. Research Integrity Office, 2008, 2009).

Dealing with allegations of misconduct. Clear and implemented procedures for handling research misconduct allegations are considered to promote research integrity (All European Academies et al., 2003). It is explicitly stressed that research institutions should have adequate procedures in place for dealing with research misconduct allegations (All European Academies et al., 2003; German Research Foundation, 1998; Health Research Board, 2008a, 2008b, 2008c; Medical Research Council, 2009; Ministry of Science and Information Technology, 2004; Royal Netherlands Academy of Arts and Sciences, 2001; Spanish Bioethics Committee, 2010; U.K. Research Integrity Office, 2009; Universities UK, 2012). The employer of the researcher or the research institute has the prime responsibility for handling research misconduct allegations (All European Academies et al., 2003; Health Research Board, 2008b; Hungarian Academy of Sciences, 2010; National Academy of Finland, 2003; National Advisory Board on Research Ethics, 2002; Royal Netherlands Academy of Arts and Sciences, 2001; Swedish Research Council, 2011; Wellcome Trust, 2005).

Various elements concerning these procedures are emphasized by the guidelines (see Table 2: 2.5). The proper handling of research misconduct allegations is in the interest of the public and its trust in science, and it is crucial for all the stakeholders in science: the research community, the researchers, and the possible whistle-blowers (Irish Council for Bioethics, 2010; National Advisory Board on Research Ethics, 2002).

Several guidelines underline that no punishment should be made until the misconduct is proven (see Table 2: 2.5). The National Academy of Finland, however, states, "In serious cases even the suspicion of a violation will be grounds enough to make the decision not to award funding" (National Academy of Finland, 2003).

Preventing misconduct. Various possible actions are mentioned to prevent misconduct. The research environment is important, but research integrity training features most regularly (see Table 2). A total prevention of misconduct is judged impossible (German Research Foundation, 1998; Ministry of Science and Information Technology, 2004).

Discussion

Research Integrity

As shown in the results, the inaccurate preservation of data possibly threatens research integrity. The European Code of Conduct for Research Integrity states that original data should be stored for "at least 5 years, and preferably 10 years" (European Science Foundation & All European Academies, 2011). The guideline of the InterAcademy Council, however, refers to the requirements of the specific scientific discipline or the law (InterAcademy Council, 2012). Researchers can only elaborate on previous research, if the original data are carefully stored and shared with colleagues whenever possible (InterAcademy Council, 2012). However, there is a widespread reluctance to share published research data in several scientific disciplines (Firebaugh, 2007; Freese, 2007), also in biomedical research (Campbell et al., 2002; Kyzas, Loizou, & Ioannidis, 2005; Reidpath & Allotey, 2001). Even when authors signed the journal policy to share their data, many authors refuse to do so (Savage & Vickers, 2009; Wicherts, Bakker, & Molenaar, 2011).

Research Misconduct

With the exception of the Swedish guidelines, as described above, the intention to deceive is considered to be a key element in defining research misconduct (Fanelli, 2009). Despite the difficulty of determining whether an action was committed intentionally, the European Code of Conduct states that the response toward research misconduct should consider whether it was committed "intentionally, knowingly or recklessly" (European Science Foundation & All European Academies, 2011).

Plagiarism is often considered to be less serious than fabrication and falsification because it does not affect the scientific record (Fanelli, 2009; Steneck, 2006). The European Code for Research Integrity states that, unlike fabrication and falsification, plagiarism "is supposed to be more injurious to fellow scientists than to science as such" (European Science Foundation & All European Academies, 2011). Remarkably, only one of the guidelines analyzed also considers plagiarism to be less serious than fabrication and falsification (Ministry of Science and Information Technology, 2004). Interestingly, this line of reasoning looks at the possible impact of actions on science. Following the same consequentialist logic, continued unintentional carelessness should be considered as reprehensible as fabrication because it can also severely damage science.

The Organisation for Economic Co-Operation and Development (2007) adds several factors that contribute to research misconduct: the negative sides of fragmentation, isolation, and specialization; and the difficulty of verifying results because some specialized instruments can only be operated by one researcher.

The costs of research misconduct go far beyond monetary costs. Research misconduct threatens the progression and existence of science. The direct financial costs of "all of the allegations of misconduct reported in the United States to the ORI (n = 217 cases) in their last reporting year . . . would exceed $110 million" (Michalek, Hutson, Wicher, & Trump, 2010). More specifically in biomedical research, research misconduct can result in defective materials, threatening medical procedures, the wasting of resources, faulty policies, reputational damage to both the institution and other researchers, the victimization of patients or other researchers, and the loss of patient trust (Chopra & Eagle, 2012; InterAcademy Council, 2012; Michalek et al., 2010). These consequences are direct and indirect infringements of the crucial principle of non-maleficence (Beauchamp & Childress, 2008). This demonstrates that research misconduct and integrity are not just a matter of social behavior, but are also of medical and ethical importance.

The peer-review system is also criticized in the scientific literature when it comes to detecting research misconduct (Benos et al., 2007; Smith, 2006; Wicherts, Kievit, Bakker, & Borsboom, 2012). The report of the InterAcademy Council states that peer review tends to be conservative, supportive of conventional research performed in prestigious research institutes, is susceptible to the subjectivity of the reviewers and is not designed primarily to detect unacceptable practices (InterAcademy Council, 2012).

Research integrity training is referred to most frequently to prevent research misconduct, although its effectiveness has been questioned (Anderson et al., 2007; Kornfeld, 2012). Major issues concerning training remain unanswered, for example, who should be the trainees and who the trainers (Godecharle, Nemery, & Dierickx, 2013b)?

The European continent is characterized by great cultural diversity, with countries having different legal systems and research traditions. Therefore, the guidelines also differ strongly in their origin. Some documents were published by ministries, others by national organizations; some are laws, some are "only" guidelines (see Table 3).

Underlying Approaches: Norms or Values?

The current heterogeneity in the guidelines can be explained by using an ethical reflection that distinguishes the essence of values and norms (ten Have, Ter Meulen, & van Leeuwen, 2008). Values are universal and guide people in what or how

Table 3. Overview of the origins of the guidelines.

Origin of the guidelines	Guidelines (n = 49)
Published by ministries	1
Laws	3
National Bio-Ethical Committees (listed by the World Health Organization)	6
National Research Integrity Governance Frameworks	8
National Academies of Sciences (member of All European Academies)	11
National Research Organizations	20

they ought to be. Values are translated into norms, which are embedded in a specific context: situation, time, and place. Norms are subject to change. They must be adhered to and generate clear rules. Values, however, feature on the level of education and role models. This distinction can also be applied to the context of research. The value of verifiability, for example, is translated in certain norms, which can contradict one another. As stated earlier, the adequate preservation of raw data is essential for verifying the results. However, the value of verifiability is translated into different norms about how long these data should remain accessible. Some guidelines, for example, refer to the varying requirements of scientific disciplines (Academy of Sciences of the Czech Republic, 2010; Hungarian Academy of Sciences, 2010; Swiss Academies of Arts and Sciences, 2008). Other guidelines give a very clear time limit: The raw data should be kept safe and unaltered for at least 3 years (U.K. Research Integrity Office, 2008, 2009), 5 years (Association of Universities in the Netherlands, 2012; Danish Committees on Scientific Dishonesty, 2009; Spanish National Research Council, 2011), or up to 10 years (Austrian Agency for Research Integrity, 2010; German Research Foundation, 1998).

We stated earlier that we distinguished a positive and negative approach in the guidelines, focusing on research integrity and misconduct, respectively. Translating this into the ethical concepts of values and norms, we can distinguish a value-based and a norm-based approach, respectively. This distinction enables us to understand the current regulatory diversity. It is difficult to give a universally accepted guidance on particular norms. Definitions of misconduct, for example, are based on norms. The unavoidable differences in research contexts will lead to diverse definitions. For example, the Hungarian guideline qualifies the unjustified restriction of the freedom of research as a form of misconduct, which is as serious as the fabrication of research data (Hungarian Academy of Sciences, 2010). While, as demonstrated earlier, the Danish guidelines give a far more restricted definition of research misconduct (Danish Law, 2009; Danish 787 Law, 2010). A value-based approach however, relies on values, which are more universally accepted. Most researchers would agree to a list of certain values, such as honesty, that describe how a researcher should be. The Singapore Statement on Research Integrity, a global guideline published after the 2nd World Conference on Research Integrity, for example, does not give a clear definition of misconduct (Singapore Statement on Research Integrity, 2010). However, it does refer to several values, such as accountability and honesty.

The general regulatory approach taken by countries or organizations is founded on a value-based or norm-based approach. Countries with a more legalistic approach, for example, Denmark, include a clear definition of misconduct in law and therefore focus on certain norms. However, Belgium uses a more value-based approach. Based on our correspondence with the developers of the Belgian guideline, we found that they chose to create a moral code based on values, rather than a legal document. They stated that a law would be in need of constant adaptation. Some countries and guidelines combine both approaches.

The distinction between a value-based and norm-based approach is also applicable toward the possible prevention of research misconduct. The importance of the mentors is often stressed, because of their great impact on the daily research culture of a lab (Anderson et al., 2007; Kornfeld, 2012). Research integrity training is judged to be ineffective if the mentors do not adhere to the content of these trainings. Mentors also give applied guidance, by prohibiting, allowing, or preferring certain practices. However, the greatest impact of the mentors is their guidance on the level of values. Mentors demonstrate what or how a researcher ought to be. Their example serves as guidance throughout the careers of their trainees. Because the context of research is bound to change, the norms will change as well. What is accepted in certain time and place might be frowned upon in another. The values of the mentors have a longer and more stable impact, because they are translated into particular norms over and over again.

Whom or What Do We Trust?

The different approaches taken to stimulate research integrity, prevent and sanction research misconduct are also based on trust. We can distinguish two different approaches toward trust (Luhmann, 1968/2000). One approach emphasizes the trust in the integrity and responsibility of the researchers. It resembles to the value-based approach. We should be able to trust scientists and therefore, we should emphasize values and principles instead of rules and sanctions. For example, a Polish guideline states:

> The ethics of humankind bind scientists in the same way as they do all other men and women, but the responsibility of the scientist is greater, because of a higher degree of consciousness, and also because scientists are assigned high rank in the social hierarchy and perceived as authorities in public life. (Polish Academy of Sciences, 2001)

Increasingly, we see a shift in research guidance and in society in general, toward a second approach, which focuses on the trust in control systems (Luhmann, 1968/2000). The trust in control systems resembles to the norm-based approaches. Two perspectives feature here concerning science: internal and external control systems. Within the internal control system, the scientific system itself is often viewed upon as self-correcting and trustworthy. Publications and grant applications are reviewed by peers; a hypothesis and science in general is always based on previous research. If research is fraudulent, certainly if it is ground breaking, it will be detected sooner or later. The self-correcting ability of the scientific system has, however, been criticized (Titus et al., 2008). Inherent to this approach is to consider science as an entity on itself, with its own rules and sanctions. Research misconduct is not considered to be an issue for the legal courts. Within the external control system, other forms of control and sanctions are emphasized, for example, regular data audits performed by researchers who are not directly affiliated with the project, which is common in pharmaceutical companies; the possible intervention of the police in research misconduct allegations ("Call the Cops," 2013); and legal sanctions for people who committed research fraud. According to this approach, researchers can learn from police investigations ("Call the Cops," 2013). Therefore, it implies that research misconduct can be a matter for the legal courts. This reasoning goes against the other perspective that makes a clear distinction between the world of science, which cannot be understood by laypeople, and the legal court:

> A natural response to a police investigation is that outsiders could never understand the academic system well enough to sit in judgement. Really? Police forces worldwide routinely deal with financial and computer crimes, the details of which can seem equally impenetrable. Understanding what a western blot is and why it shouldn't be tampered with are obvious challenges for a non-scientist—as is understanding the mysteries of the academic world and the role of peer-reviewed publications within it. But the police know a thing or two about conducting an investigation. And any external inquiry has a distinct advantage: it cannot be hindered by the intrinsic threat of conflict of interest that comes when any community sits in judgement on its own members. ("Call the Cops," 2013)

Conclusion

We risk talking past each other, if we do not consider the different perspectives on trust and if we do not take the distinction between the value- and norm-based approaches into account. Although they are not mutually exclusive, the norm-based and value-based approaches have a different focus and purpose. A norm-based guidance generates clear and applied rules, whereas a value-based approach focuses on principles and role models. Research is becoming ever more interdisciplinary and international (Alberts, 2012), which enables a more value-based approach because of its more universal nature. Because research always takes place in a specific context, there is nonetheless also a need for clear norms, and therefore for a norm-based approach. The defining of research misconduct, for example, gives researchers a clear framework, which helps them in balancing their research conduct. In addition, the vast amount of guidelines is not helpful, due to the differences between them, sometimes even within one country.

Research Agenda

Researchers currently need to balance their research conduct in a context of heterogeneous standards and guidelines concerning research integrity and research misconduct. This will not stimulate research integrity. More research is needed to investigate the current research integrity guidance. It is important to further document, describe, and analyze how different institutions handle research misconduct allegations and how they try to prevent misconduct. It can give us an insight into whether and how the guidance on a national level are implemented in universities and research centers, for example. In addition, more empirical research is needed to document and analyze the perspectives of the researchers themselves. What are their perspectives and attitudes concerning research integrity and misconduct?

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Notes

1. The Latvian guideline, however, is ambiguous on the criterion of who can qualify as an (co-)author. Although it emphasizes creativity, it states the following: "Only on the author's (or authors') own initiative, by tradition, the leader of the scientific school (or the scientific advisor) can be mentioned

as a co-author, putting his surname as the last one. No automatic co-authorship is admissible as regard to the administrative leaders of the institution, chair or other structural unit" (Latvian Academy of Sciences, 1997).

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